FAULT MANAGEMENT

Open Systems-Joint Task Force

WALCOFF AUDITORIUM

29 May 1996

FAIRFAX VA

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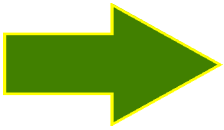
Diane Paul

Texas Instruments, Software

OUTLINE

Naval Surface Warfare Center
DAHLGREN DIVISION



BACKGROUND (AGENT BRIEFS)

- **TECHNICAL DETAILS**
- **FY97 RECOMMENDATIONS**
- **SUMMARY**

BACKGROUND

Naval Surface Warfare Center
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GENERAL PROBLEM:

- Military embedded applications need fault management services
- Complex applications are hard to port
- Fault Management Lacks Standardization at the API of OS
- Advances in Technology Rapid
- Acceptance of Open Systems use still needs validation

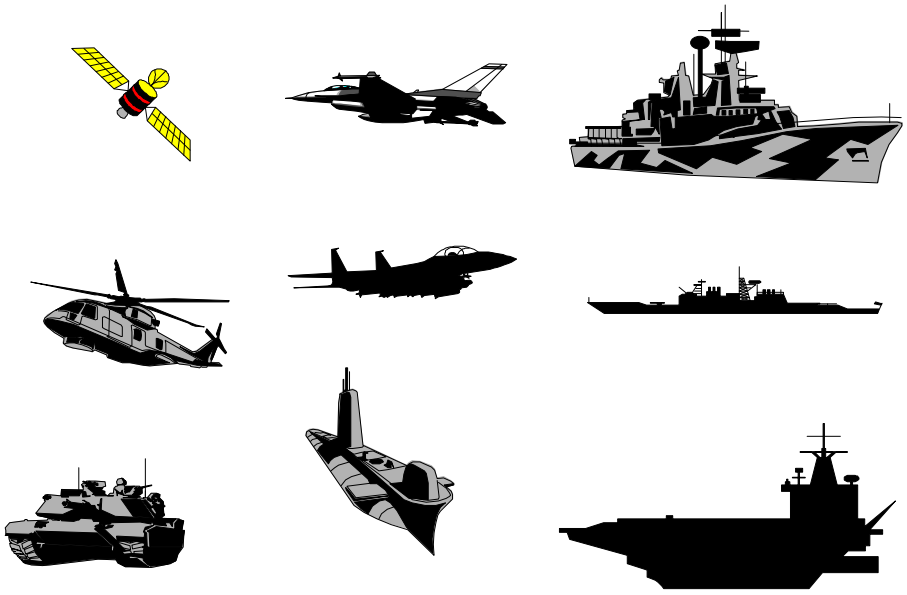
SOLUTION:

NSWCDD, Texas Instruments, Loral, will:

- prototype and demonstrate POSIX Fault Management APIs written in Ada on combat system, & avionics system
- Pool our efforts as a team for success
- Report on lessons learned back to OSJTF, DOD, & standards working Gr.
- Labs and Contractor must attend the standards working groups

BENEFICIARIES:

- Space Station Freedom
- Joint Strike Fighter
- SC-21
- NSSN
- Crusader Mobil Artillery
- CVX adv Carrier
- LHX landing
- LPD17 Flight II
- Arsenal Ship



PROJECT OVERVIEW

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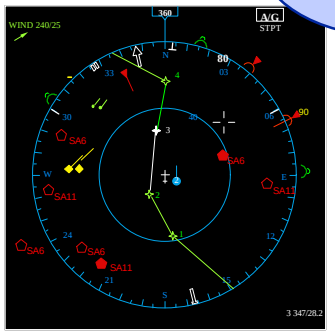
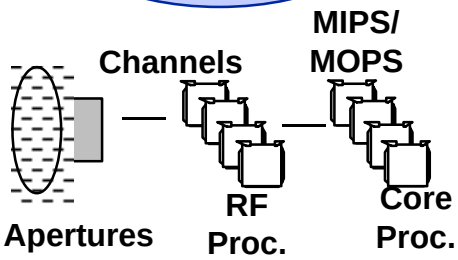
OPEN SYSTEMS DEMONSTRATION

Prototyping/ Simulation



Proprietary vs IEEE/ANSI Benchmarks



OPEN SYSTEMS STANDARDIZATION

- **IEEE POSIX P1003.1h**
- **SERVICES FOR RELIABLE AVAILABLE AND SERVICEABLE SYSTEMS (SRASS)**
  - DETECTION
  - DIAGNOSIS
  - CORRECTIVE ACTIONS
  - LOGGING AND NOTIFICATION

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ARCHITECTURAL PERSPECTIVE
.1h FAULT MANAGEMENT MODEL

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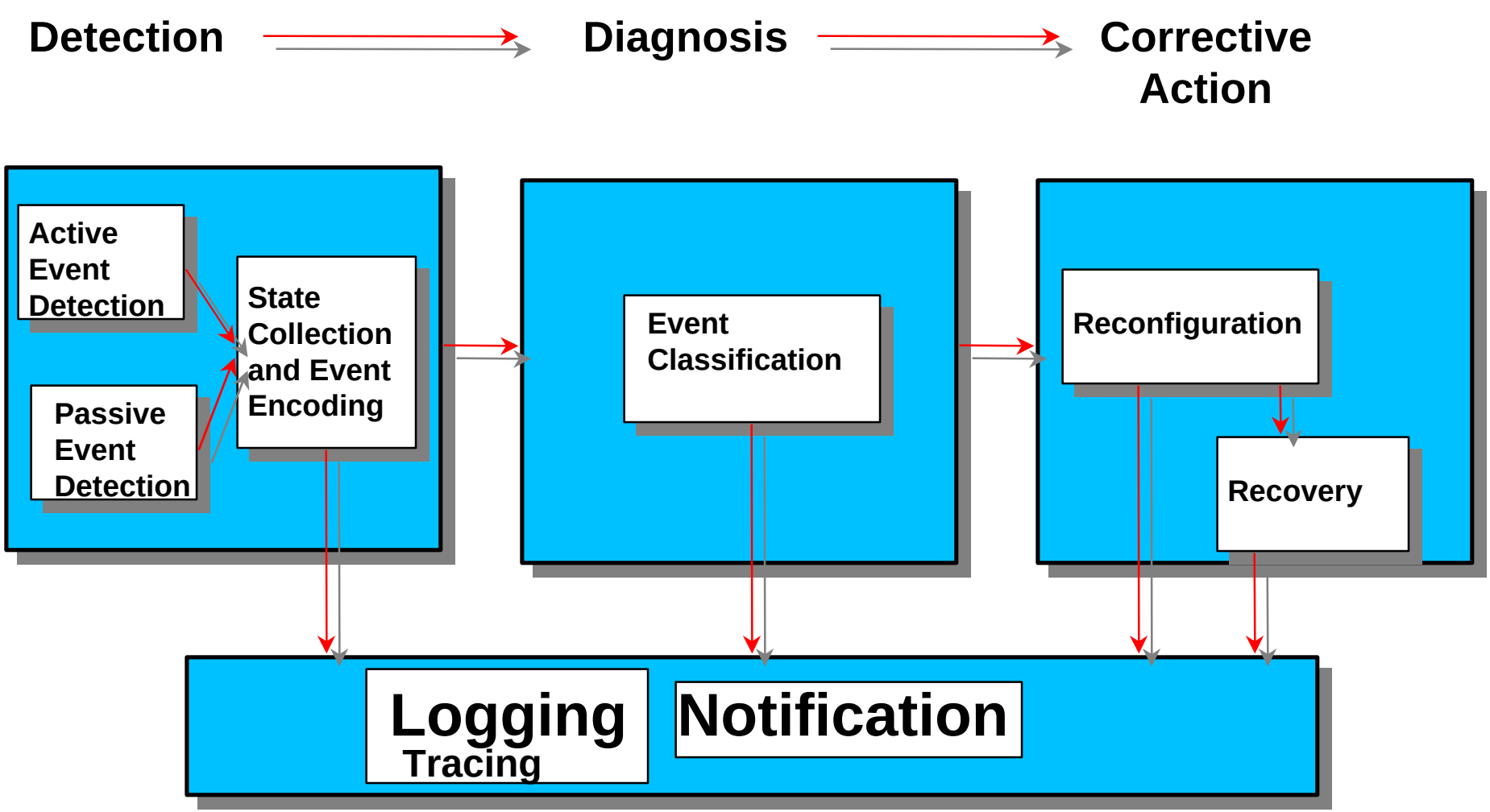

DEMONSTRATION ENVIRONMENT

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- **PROTOTYPE AEGIS COMBAT ENVIRONMENT APPLICATION SOFTWARE CODES PORTED to HiPer-D TESTBED**
  - **Heterogeneous COTS SUN Sparc 10, 1 Pentium PC, Alpha 200, Silicon Graphics, TAC4s, Dec Sable, DecStation 5000/240**
  - **SM-2 Engagement Senario**
  - **Ada, Ada95, and C**
  - **GNAT Ada95 COMPILER**
  - **OS Source code OSF-RT**
  - **Fully Instrumented,**
  - **Time Synchronized**
  - **4 different Networks FDDI, ATM, MYRINET, FIBRE Channel**
- **IMPLEMENT AND DEMONSTRATE POSIX FAULT MANAGEMENT APIs IN ANTI-AIR WARFARE ENGAGEMENT**

SRASS STANDARDIZATION PROCESS & STATUS (IEEE)

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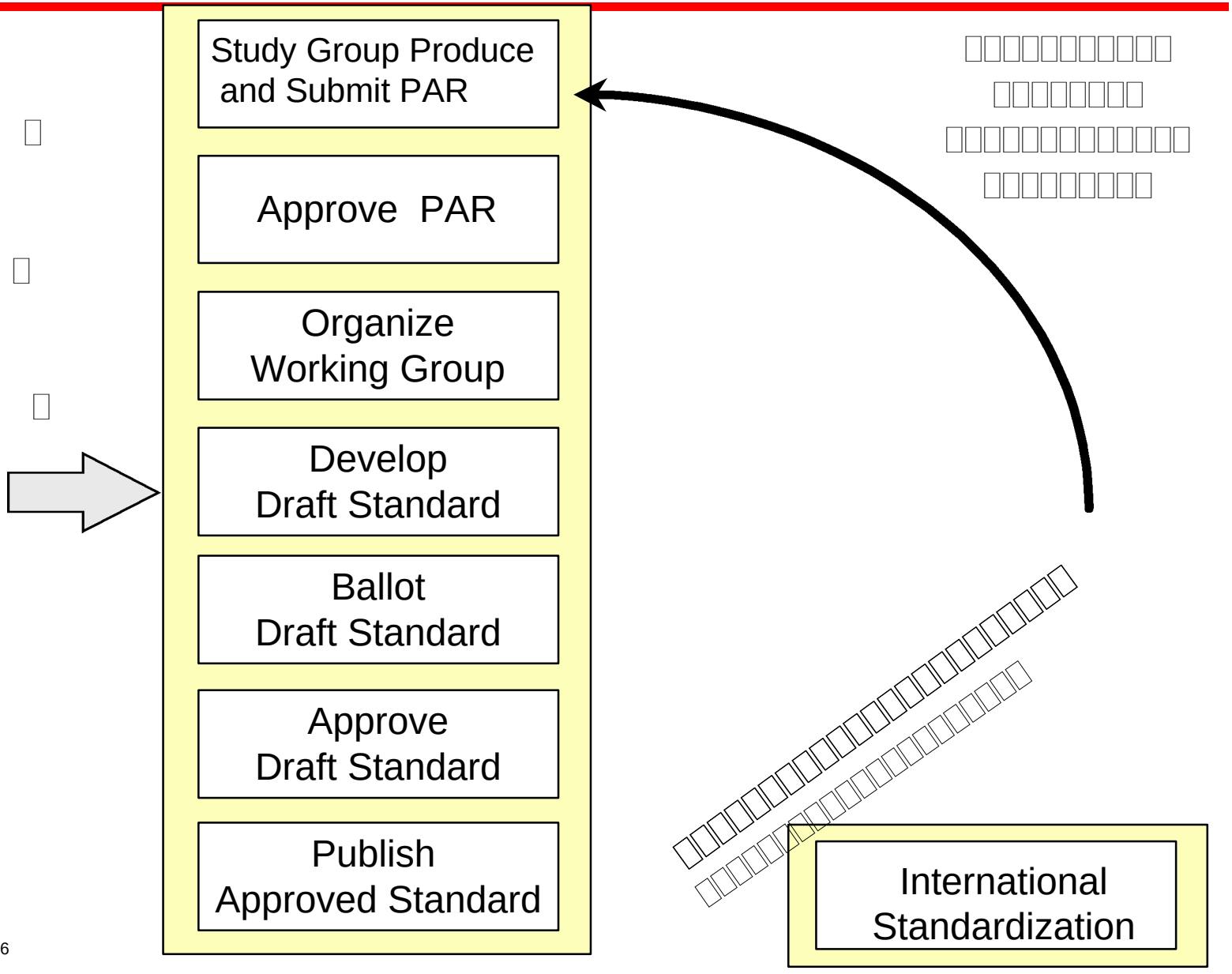

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FY97 RECOMMENDATIONS (1)

Naval Surface Warfare Center
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- **Continue to fund Texas Instruments .1h prototyping & demonstration of SRASS APIs in Ada in Avionics Environment**
- **Fund NSWCDD Prototyping and Demonstration of SRASS APIs in Ada in a Combat Environment**
  - **The AEGIS SM-2 Engagement senario offers a wide range of fault management application opportunities**
  - **Instrumented HiPer-D Engineering testbed ideal for demonstration and prototyping**
- **Fund to continue NGCR funding start of LORAL's evaluation of SRASS Error logging in a Network Time Protocal application for Q-70s time synchronization.**

FY97 RECOMMENDATIONS (2)

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- **Prototyping efforts should have teaming to share lessons learned, problems etc.**
- **Prototyping efforts should be done in Ada**

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SUMMARY

Naval Surface Warfare Center
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- **STANDARDIZATION OF FAULT MANAGEMENT FEATURES WILL MINIMIZE THE RE-INVENTION OF THE WHEEL EACH TIME THE DOD BUILDS A NEW SAFETY & RELIABILITY CRITICAL CART**
- **PROTOTYPING & DEMONSTRATION OF PROPOSED POSIX INTERFACE STANDARD SUPPLEMENTS WITH MILITARY REQUIREMENTS WILL ACCELERATE DEVELOPMENT , ACCEPTANCE AND BALLOTING OF .1h**
- **CONSISTENT FUNDING AND SUPPORT THROUGH FY99 REQUIRED TO PUBLISH INTERNATIONAL STANDARD**
- **PROTOTYPING AND DEMONSTRATION PERSONNEL MUST ATTEND POSIX WORKING GROUPS**
- **.1h WILL BE KEY ELEMENT IN MILITARY APPLICATIONS**

ISSUES

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- INSUFFICIENT INTEREST TO MAINTAIN WORKING GROUP AND DEVELOP A BALLOT POOL
  - A SINGLE USER DOESN'T AN INDUSTRY CONCENSUS MAKE
- FY97 FUNDING REQUIRED TO RESOLVE BALLOTING ISSUES
- WHO SHOULD Ada PACKAGE SPECIFICATIONS BE DELIVERED TO?
- MOST OF PROJECTED INTERFACES ARE UNIQUE TO PARTICULAR PROJECT AND DON'T LEND THEMSELVES WELL TO STANDARDIZATION
- GO FOR TRIAL PRACTICE STANDARD OR GO FOR ALL UP STANDARD?

BACKUPS

APPLICABLE TECHNOLOGY (EXPERIENCE)

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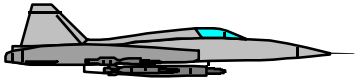
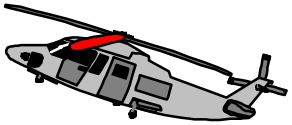
LEGACY / HERITAGE SYSTEMS



F-22 Advanced Tactical Fighter

- Avionics Operating System used in the Integrated Core Processor



AH-66 Comanche Helicopter

- Longbow Targeting

APPLICABLE TECHNOLOGY (FUTURE AFFORDABILITY)

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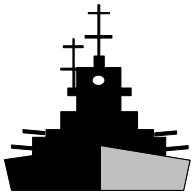
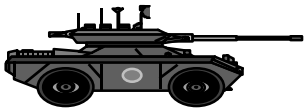


Surface Combatant for the 21st Century

- Cooperative Engagement System
- GCCS/IFF/MIDS Antenna & Processors



M1A1 Vetronics Pre-Planned Product Improvement

- Add GCCS/IFF/MIDS Antenna & Processors

Crusader Mobil Gun

- Weapons Solution Computer

Arsenal Ship

- Ship Control

Joint Strike Fighter

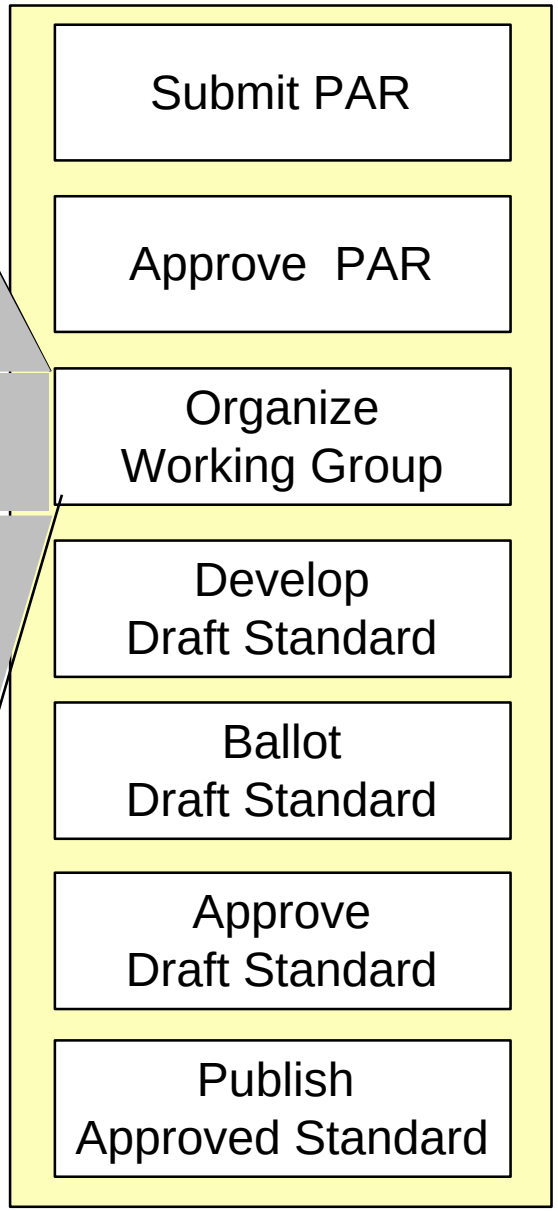
- Integrated Core Processor

Dark Star UAV Tier III-

- Sensor Collection & Distribution System

CORPORATE & GOVERNMENT INVOLVEMENT (WORKING GROUP MEMBERS PROMOTING STD)

- **CHAIR**
  - **Helmut Roth NSWCDD**
- **VICE-CHAIR**
  - **Arun Chandra IBM**
- **SECRETARY**
  - **Richard Scalzo NSWCDD /TBD**
- **TECHNICAL EDITOR**
  - **Steve Dovich Sequioa**
- **BALLOT COORDINATOR**
  - **TBD**
- **INTERNATIONAL STANDARDS LIAISON**
  - **TBD**



UNDERSTANDING IEEE STANDARDIZATION

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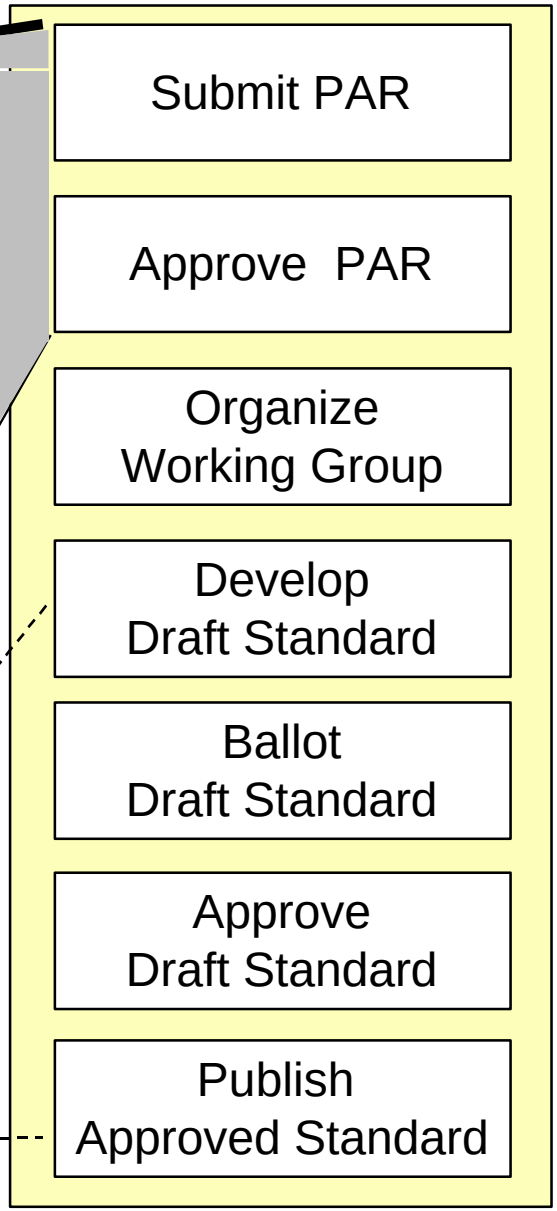
Project Authorization Request (PAR)
- Valid for Four Years
- Standard "shall"
- Recommended Practice "should"
- Guide "may"

Types
- New
- Revision
- Supplement

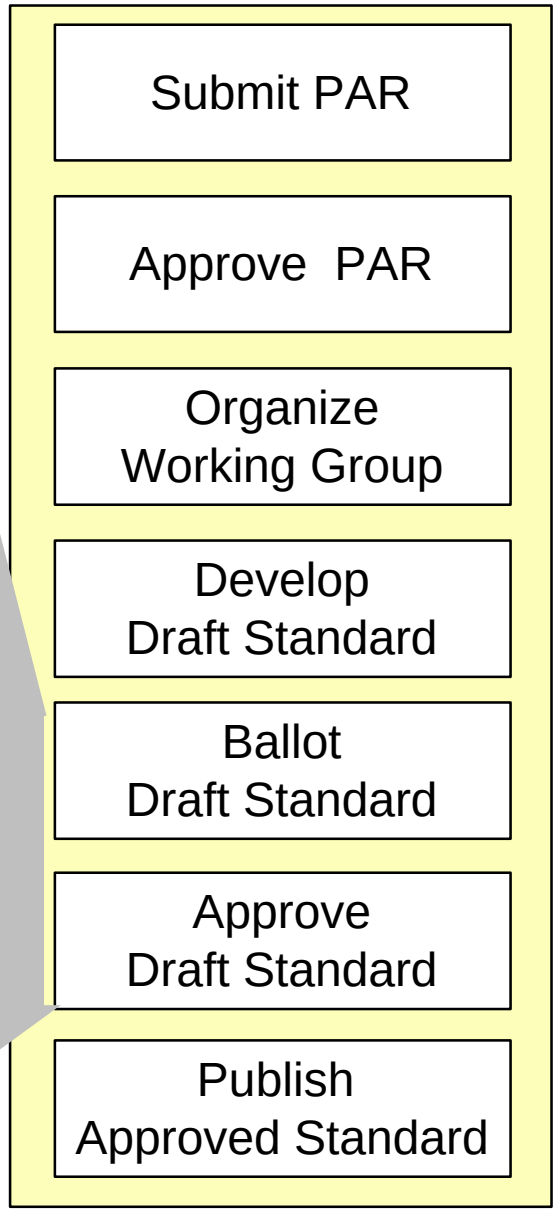
Numbering
- Seperate, but related ---1003.#
  - base + number
- Supplements/amendments --- 1003.a
  - base + letter

- **1003.1 Systems**
- **1003.1h Systems, SRASS**
- **1003.1b Systems, Real-Time**



STANDARDS APPROVAL PROCESS (IEEE)

- **BALANCED**
  - **Producers**
  - **Users**
  - **General Interest**
-
  - **Possible**
-
  -
  -
-
  -
  -
  - **Recirculation for Editorial Comments**



THE UNIX WARS ARE OVER -- FOR MIS & C4I SYSTEMS

- **UNIX DEVELOPED IN EARLY 80s FOR WORKSTATIONS**
- ***SUNOS™, ULTRIX™, HPUX™, & RISC/OS™* IMPLEMENT *AT&T SYSTEM V™* & MANY *BERKELEY (BSD 4.3)* ™ INTERFACES**
- ***NGCR* SPONSORS POSIX REAL-TIME .1b SUPPLEMENT DEVELOPMENT**
- ***Ada JPO* SPONSORS POSIX Ada .5 BINDINGS**
- ***OPEN SOFTWARE FOUNDATION™* MERGED WITH *X/Open™* TO CREATE *OPEN GROUP™* IN 1995**
- **IEEE POSIX ATTENDANCE DROPS FROM 400-500 TO 65**
- ***OPEN GROUP* ADOPTS POSIX .1b APIs INTO THEIR PRODUCTS**

EMBEDDED RUN-TIME / OPERATING SYSTEMS
-- COMMON FUNCTIONALITY, LITTLE STANDARDIZATION

- **F-22 *Avionics Operating System***
- **ISI'S *pSOSystem*™**
- **WIND RIVER'S *VxWorks*™**
- **LYNX REAL-TIME SYSTEMS' *LynxOS*™**
- **JMI SOFTWARE SYSTEMS**
- **U.S. ARMY MICOM *RTEMS*™**
- **ETC.**

EVOLVING TECHNOLOGY
-- IS IT READY FOR STANDARDIZATION?

- **MICROWARE'S "*OS-9*" *DIGITAL AUDIO/VIDEO INTERACTIVE DECODER (DAVID)* ™**
- **SPECTRON'S *SPOX*™**

IEEE 1003.1h SRASS CORRECTIVE ACTIONS

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- Reinitialization
- Checkpoint Processing
- Off-line Diagnostic Support
- Reconfiguration
- Resource Control
- Event Injection
- Fault Containment
- Retry
- Fault Masking

IEEE 1003.1h SRASS
LOGGING AND NOTIFICATION

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- **Logging Events**
- **Report Generation**
  - **(produce a formatted report of events)**
- **Notification**
- **Distributed System Support**
- **Human Error Avoidance**

P1003.1h/SRASS API TIMELINES

Top Level Services	Term	Existing Practice	Initial Draft	Mock Ballot
Event Logging	10/94	1/95	7/95	1/97
Event Notification	10/94	1/95	7/95	1/97
Tracing	10/94	1/95	1/96	unkn
Dumps	10/94	1/95	7/95	1/97
Fault Detection	1/95	10/95	7/96?	1/97?
Fault Masking	1/95	OBE	OBE	OBE
Retry/Recovery	1/95	10/95	10/95	1/97
Configuration Management	1/95	4/95	7/95	1/97